THE WORK OF THE WEATHER BUREAU FOR THE BENEFIT OF HORTICULTURE.

(A paper read by Montrose W. Hayes, Local Forecaster, Weather Bureau, before the Seventh Annual Congress of the American Apple Growers, St. Louis, Mo., August 10, 1910.)

It is the Weather Bureau's duty to make itself of benefit to the industries of the country. It is its duty also to extend these benefits whenever it is possible to widen their scope. It is certainly the spirit, if not in every case the letter, of the various laws affecting the Weather Bureau that the Bureau's officials must keep pace with all industrial advances and be prepared to render assistance whenever information about impending or past weather conditions is needed. In other words, it is not deemed sufficient that the officials of the Bureau rest content with furnishing such information as they may have calls for, but they are required to find out how a knowledge of meteorological or climatic conditions can help the country's business, and then to furnish the needed information.

Horticulture has received considerable attention already, but it is a field that is broad, and there is room for the extension of the methods by which the Weather Bureau can aid the fruit grower.

The relations between the Bureau and the horticulturist should be divided and considered under two heads—Meteorology and Climatology.

Meteorology has to do with weather forecasting and has received by far the greater share of consideration. It is, too, the most important, so it will be taken up first in this paper.

Orchard heating has been given a prominent place in your program. It is a subject I am not going to attempt to discuss directly, but it is the one that interests me more than any of the others, for it is the Weather Bureau's duty to tell you when to be prepared to heat. Of course I understand that you keep your heating appliances ready for use throughout the period during which cold weather is liable to be injurious, but even though you are in a constant state of what you may term preparedness there is always much that necessarily must be left until the cold actually begins to settle on the orchards. Then, the weather may turn cold suddenly, late at night, and cause great injury before the fires can be lighted.

Reliable warnings of impending falling temperature would greatly increase your facilities for combating the effects of the cold. They would relieve you of continuous suspense, and enable you to arrange all the minor details for heating, and be prepared in every sense. Each Weather Bureau official charged with the dissemination of forecasts has instructions from the Chief of the Bureau to familiarize himself with the crops that are grown in his territory, and to be alert to see that the growers are advised of impending weather changes that would affect their interests, so every grower of apples, unless he is a long distance from a telegraph or telephone office, can receive warnings of cold weather and frost. Arrangements for receiving the warnings may be made with the Chief of the Bureau or with the nearest Weather Bureau office, and those of you who have not been receiving them can get them without any great amount of formality.

There is one phase of this subject that should be brought to your attention especially, for if you are given a clear understanding of it you will know better how to be guided by the warnings. It is the impossibility of issuing a warning that will apply with equal force over all of any given section of the country, for sometimes in just one orchard a wide variance in the temperature readings can be noticed. Say, for instance, a forecast of a temperature of 30° is issued for southwestern Missouri. The official making the forecast has no means of knowing what the temperature will be on every hill and in every valley of the southwestern part of the State; therefore, he is making a forecast that he expects to be verified by the thermometer readings made at Springfield. In a few minutes I want to have more to say about the decided differences that occur in very small areas. Just now I will pass the subject by stating what all of you know; that is, these differences are very marked at times. Hence, when a cold weather or frost warning is issued it is unfair to expect it to apply uniformly to all the orchards in even a single county. The temperature might fall low enough to injure one orchard seriously and an adjoining orchard might not be hurt. This makes watchfulness necessary after receiving the warning, and several reliable thermometers are almost indispensable. The thermometers should be exposed in various parts of the orchard if the territory is very rolling and frequent readings made as the temperature falls. When the temperature approaches what you consider a dangerous point heating can begin. There is nothing new about any of this and I have no doubt some of you have followed just such a method of procedure.

Another plan for warning the orchardist of falling temperature has been advocated by several of a mechanical bent, but I can not say to what extent the plan has been used. It is to expose in the orchard a metallic thermometer, connected with an electric bell circuit, the bell to be in the dwelling. Then, by a simple mechanical device attached to the metallic thermometer, the bell can be caused to ring and wake the orchardist or his men when the temperature reaches a reading that might be considered dangerous, or a near approach to the dangerous. This scheme is not without merits. In an isolated section of the country, where the official forecasts are not available, an orchardist could rely upon it to a certain degree to warn him that he should get up and ascertain whether he should begin heating. Also in orchards not favorably situated from a temperature standpoint, over which the cold air settles as it flows down from higher ground, it might be used to advantage. The great disadvantage of the plan is the liability of the mechanism to fail to work at a critical time. At any rate it would be unnecessary wherever the official forecasts could be obtained, and very few orchardists are so remote from transportation facilities that they do not have means of electrical communication.

Under the head of Climatology something has been said and written, but I have no means of knowing how much attention has been given the subject in orchard planting. Something greatly to be desired is what may be called a complete climatic survey of the country. The Weather Bureau has made a general climatic survey and has records to show the weather conditions that prevail in a general way over almost every county of the country. These records are being added to daily, but there is a limit to what can be done by the Government in this respect. In many of the fruit-growing sections the country is not level and the topography is favorable for the occurrence of wide temperature differences. In order that the thermal eccentricities may be known numerous thermometer stations, close together, are necessary. The Weather Bureau can furnish the outline, or skeleton chart, and it remains for the horticulturist to fill it in. Work along this line would be particularly valuable to those intending to put out new trees, for it is well known that on account of "thermal belts", "frost zones," etc., some spots are in a great measure free from late frosts, while adjacent areas are very liable to late frosts and late freezes.

Expressed in popular language these belts and zones are due to air drainage. The temperature differences are most marked when the wind is calm or light. The air at night cools as a result of radiation; cold air is heavier than warm air and it drains away and settles over spots where the facilities or opportunities for drainage do not exist. These spots, therefore, are cold and the places from which the cold air has drained are correspondingly warm. This phenomenon occurs annually in western North Carolina and has received the attention of some of the world's leading climatologists. It occurs, undoubtedly, in just as marked a degree in many other parts of the country and probably to less extent in almost every hilly or rolling section. It seems that this is a matter worthy of attention by the man who is going to put out trees. The Weather Bureau stands ready to furnish all the information at its command and to give such advice as it can that would aid in investigation of this subject of air drainage or temperature inversion.